

What is claimed is:

1. A raffinose synthase which has the following properties:

(1) action and substrate specificity: the raffinose synthase produces raffinose from sucrose and galactinol;

(2) optimum pH: the raffinose synthase has an optimum pH of about 6 to 8;

(3) optimum temperature: the raffinose synthase has an optimum temperature of about 35 to 40 °C;

(4) molecular weight: the raffinose synthase has:

(i) a molecular weight of about 75 kDa to 95 kDa estimated by gel filtration chromatography;

(ii) a molecular weight of about 90 kDa to 100 kDa estimated by polyacrylamide gel electrophoresis; and

(iii) a molecular weight of about 90 kDa to 100 kDa estimated by SDS-polyacrylamide gel electrophoresis under a reduced condition;

(5) inhibition: the raffinose synthase is inhibited by iodoacetamide, N-ethylmaleimide, and myo-inositol.

2. The raffinose synthase according to claim 1, which has an amino acid sequence including respective amino acid sequences shown in SEQ ID NOS. 1 to 3 in Sequence Listing.

3. A raffinose synthase which is a protein specified by the following item (A) or (B):

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(A) a protein which has an amino acid sequence shown in SEQ ID NO: 5 in Sequence Listing; or

(B) a protein which comprises an amino acid sequence including substitution, deletion, insertion, addition, or inversion of one or several residues of amino acids in the amino acid sequence shown in SEQ ID NO: 5 in Sequence Listing, and which has an activity to produce raffinose from sucrose and galactinol.

4. A method for producing raffinose, comprising the step of allowing the raffinose synthase as defined in any one of claims 1 to 3 to act on sucrose and galactinol to produce raffinose.

5. DNA encoding raffinose synthase as defined in any one of claims 1 to 3.

6. DNA coding for a protein specified by the following item (A) or (B):

(A) a protein which has an amino acid sequence shown in SEQ ID NO: 5 in Sequence Listing; or

(B) a protein which comprises an amino acid sequence including substitution, deletion, insertion, addition, or inversion of one or several residues of amino acids in the amino acid sequence shown in SEQ ID NO: 5 in Sequence Listing, and which has an activity to produce raffinose from sucrose and galactinol.

7. The DNA according to claim 5, which is DNA specified by the following item (a) or (b):

(a) DNA which includes a nucleotide sequence

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comprising at least nucleotide residues having nucleotide numbers of 57 to 2408 in a nucleotide sequence shown in SEQ ID NO: 4 in Sequence Listing; or

(b) DNA which is hybridizable under a stringent condition with the nucleotide sequence comprising at least nucleotide residues having nucleotide numbers of 57 to 2408 in the nucleotide sequence shown in SEQ ID NO: 4 in Sequence Listing, and which codes for a protein having an activity to produce raffinose from sucrose and galactinol.

8. A chimeric gene comprising a raffinose synthase gene or a part thereof, and a transcription regulatory region expressible in plant cells.

9. The chimeric gene according to claim 8, wherein the raffinose synthase gene is DNA as defined in any one of claims 5 to 7.

10. The chimeric gene according to claim 8 or 9, wherein the transcription regulatory region is ligated with the DNA so that antisense RNA having a sequence complementary to a coding strand of the DNA is expressed.

11. A plant which is transformed with the chimeric gene as defined in any one of claims 8 to 10.

12. A method for changing a content of raffinose family oligosaccharides in a plant, comprising the steps of transforming the plant with the chimeric gene as defined in any one of claims 8 to 10, and expressing the

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gene in cells of ~~the~~ plant.

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